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LONG MATING FLIGHTS BY MALE *HYALOPHORA CECROPIA* (L.) (SATURNIDAE)

Distances from which male moths can find the pheromone-emitting females have been determined for a few species by releasing marked males and recapturing them in traps baited with females. For example, Rau and Rau (1929, Trans. Acad. Sci. St. Louis 26:81–221) recovered about 11% of the male cecropia moths released 4.8 km from their trap. Distances of over 10 km have been recorded with other species (Shorey, 1976, Animal Communication by Pheromones, Academic Press, New York). (Also see below.)

These and similarly obtained data (including ours) are not a measure of the distance over which males can perceive the sex attractant pheromone. The males' flights will, of course, include random searching as well as directed movement to the pheromone–probably via anemotaxis (Kennedy, 1977, pp. 67–91 *In*: Chemical Control of Insect Behavior, H. H. Shorey and J. J. McKelvey, Jr., eds., John Wiley, New York). Neither do such data represent the entire distance flown by the males. Their actual flight paths are unknown, but are probably almost always longer than the straight line distance between the release and recapture points. Furthermore, data such as these are only minimum estimates of the straight line distance over which males can find females. If males are released at even greater distances, some may eventually be recovered; Toliver and Jeffords (1981, J. Lepid. Soc., in press) recaptured a male *Callosamia promethea* (Drury) 36.5 km from the release point.

Exceptionally long mating flights may usually be uncommon events, but they are probably important in promoting gene flow to distant populations, and they may make it possible for populations to survive at very low densities. Since information on long mating flights is scarce, we here present data that were obtained in the course of another study.

We used three traps baited with virgin female cecropia (Sternburg and Waldbauer, 1969, Ann. Entomol. Soc. Amer. 62:1422–1429) to catch wild males in, and near, the contiguous cities of Champaign and Urbana, Illinois, from 14 May to 10 July. One trap was at the home of JGS near the eastern edge of the cities, another was at the home of GPW near the western edge of the cities, and the third was east of the cities at Trelease Woods. Straight line distances between the traps appear in Table 1. Males came to the traps just before dawn. Later they were consecutively numbered on the underside of the hindwing with a felt pen—a different color for each trap—and released at the capture site. They dispersed, but we don't know how far they went. However, they usually flew out of sight even in daylight, and presumably made another dispersal flight at dusk, several hours before the females again emitted pheromone (Waldbauer and Sternburg, 1979, Amer. Midland Nat. 102:204–208).

We caught 1069 wild males and recaptured 390 (36.5%) of them one or more times. Twenty (5.1%) of the latter were recaptured at a more distant trap (Table 1), including one reared male (not in Table 1) released at a park in Champaign and recaptured 10.1 km away at Trelease.

Wind direction and velocity are important factors in the dispersal of pheromones. They determine the direction in which the male will fly and affect the distance that he can fly. We cannot determine the wind conditions that prevailed while the males made their way to the recapture sites. Wind direction and velocity may vary from hour to hour, and all but two of the nineteen recaptured males in question had from two to eight days to reach the recapture sites (Table 1). Thus, the winds almost certainly varied as these males moved toward the traps on any one of several nights or on some combination of two or more nights. Weather records for our area include the mean daily wind velocity and direction; these generally varied from day to day between the day of release and the day of recapture.

The frequency of occurrence of long flights may change with the population density of the wild moths. At lower densities than prevailed during our experiment, more long flights should occur because wandering males will be less likely to encounter the aerial

TABLE 1. Number of male *Hyalophora cecropia* recaptured at sites other than the release point, the distance between these points, and the number of days that elapsed between release and recapture.

Trap at which male was:		Distance (km) between traps	No. males	Days (or range) between captures
Released	Recaptured			
JGS	GPW	6.8	8	3–8
GPW	JGS	6.8	8	1–7
Trelease	JGS	6.8	1	1
JGS	Trelease	6.8	1	2
GPW	Trelease	12.5	1	8

pheromone trail of a wild female before encoutering a trail from one of the traps. Similarly, in natural situations (without traps), the average distance flown by males searching for females should increase as the population density decreases. Our data (Table 1) suggest that for male cecropia moths these distances may be very long, and that reproduction could, therefore, continue even at very low population densities.

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HINDTIBIAL DEFENSIVE SPURS IN THE NEOTROPICAL SPHINX MOTH *AMPLYPTERUS GANNASCUS*?

A noticeable morphological feature of most adult Sphingidae is the double pair of elongate spurs on the tibia of the hindlegs (W. Rothschild and K. Jordan, 1903, A Revision of the Lepidopterous Family Sphingidae, Novitates Zool., Vol. 9, Suppl.). There is usually a proximal and terminal pair of these spurs, which are modified spines. The functional role, if any, of these structures is unknown. However, they are conspicuously long and rigid in some sphingid taxa. In this note I wish to suggest a possible defensive role of these hindtibial spurs in sphingids, based upon my being jabbed by the spurs of *Amplypterus gannascus* (Stoll) to the point of considerable bleeding.

On the evening of 19 June 1980 at about 1600 hours, I collected several freshly-eclosed adults of various sphingids resting on the lighted wall of a "cacao beneficio" building at "Finca Experimental La Lola," a large cacao plantation along the railroad line connecting Guapiles with the Caribbean port city of Limon, Limon Province, Costa Rica. Upon picking up one of the largest specimens, I suddenly felt a very painful stab into one of my fingers. At first I thought it was a wasp sting, thinking that I had inadvertently picked up a wasp in the shadows along with the moth. A copious flow of blood told me that I had been jabbed with something very sharp. The moth turned out to be *A. gannascus* and close examination revealed very long (10 mm) and stout hindtibial spurs (Fig. 1) capable of piercing soft tissues without hindrance. The spurs were present only on the hindtibiae of the moth.

Amplypterus gannascus is widespread throughout Central and South America and the Caribbean (A. Seitz, 1924, Macrolepidoptera of the World, Vol. 5, American Rhopalocera, Stuttgart) and it is one of the larger sphingids attracted to lights in lowland